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Commitment and Automobile Insurance Regulation in France, Quebec and Japan

Abstract

Information problems have a large role to play in insurance markets and the regulations governing these markets were in part designed to take such problems into account. Classification variables are usually the tools used to reduce adverse selection, whereas bonus-malus (or merit-rating) schemes are introduced because risk categories lack homogeneity or fairness and because such categories do not really take moral hazard into account. Recent research findings also highlight the role **commitment** plays in bolstering incentives when faced with moral hazard in a bonus-malus scheme. In this paper, we shall give a detailed analysis of two different automobile insurance markets: those of the province of Quebec, in Canada and France. We will also document the Japanese regulatory system and that of other countries in Europe. In France and Quebec, adverse selection does not seem to require tight regulation, but regulated commitment does seem to help control moral hazard in both insurance regimes. Finally, we will show that the deregulation of insurance was a major concern for Japanese government over the recent years.

Keywords : Automobile Insurance Regulation, Adverse Selection, Moral Hazard, Commitment, Bonus-malus, Contracts.

JEL Classification : D80.

Résumé

Les problèmes d'information jouent un rôle important dans les marchés d'assurance et les réglementations de ces marchés ont été mises en place, en partie, pour en tenir compte. Les variables de classification des risques sont, en général, des instruments de réduction de l'antisélection, alors que les systèmes bonus-malus sont introduits pour réduire le risque moral, en tenant compte du fait que certaines classes de risque peuvent ne pas être suffisamment homogènes. Des résultats de recherches récentes mettent en lumière le rôle de l'engagement aux contrats pour inciter les assurés à une prudence plus élevée dans un système bonus-malus en présence de risque moral. Dans cette recherche, nous proposons une analyse détaillée de deux marchés d'assurance automobile : ceux du Québec et de la France. Nous documentons également le système de réglementation du Japon et d'autres pays européens. En France et au Québec, l'antisélection ne semble pas exiger une réglementation importante, mais la réglementation de l'engagement aux contrats semble être efficace pour contrôler le risque moral. Finalement, nous montrons que la déréglementation de l'assurance a été une préoccupation importante pour le gouvernement japonais au cours des récentes années.

Mots clés : Réglementation de l'assurance automobile, sélection adverse, risque moral, engagement aux contrats, bonus-malus, contrats.

Classification JEL : D80.

Introduction

The world is changing and markets are becoming more integrated across countries. A direct consequence is that traditional regulations must be adapted to this new reality. The foundations of any regulatory revisions must, however, be given careful consideration, in order to protect participants in the different markets against undue risks. It is now a well-documented fact that the liberalization of financial markets has made doing business more risky. For example, new risk-management mechanisms are being used to regulate the risks (credit and market) facing banks in many countries, so as to protect depositors and governments (lenders of last resort) who want to see banks stay in business. Regulation of capital is often justified by information problems (moral hazard and adverse selection) generated by fixed-rate deposit insurance which may tempt managers to take greater risks than they would otherwise (Crouhy et al., 2000).

Credit-risk regulations are designed to handle similar information problems arising between banks and entrepreneurs. More specifically, credit-rating and monitoring policies are set up to protect banks and to evaluate the amount of capital they need. Banks having developed effective internal credit-risk models will require less capital.

Information problems also have a large role to play in insurance markets and the regulations governing these markets were in part designed to take such problems into account (Skipper and Klein, 2000). Automobile liability insurance is mainly designed to deal with moral hazard and maintain standard road-safety incentives. In the absence of liability insurance, appropriate rate-setting schemes are necessary to provide similar incentive for road safety. (On liability insurance, see the recent survey of Harrington and Danzon, 2000.)

Tight control of premium rates may be justified to protect policy-holders and minimize the differences between insurers when search costs are high. Standard rating activities are often implemented to protect consumers by regulating and standardizing the effects of moral hazard and adverse selection in many countries but especially in those where insurance is compulsory. However, large gaps have been observed between different countries and states. In France, for example, insurers now have complete freedom to set basic rates and classification variables, but they are obliged to apply the same bonus-malus system to all policy-holders. In Belgium and in Germany, until just recently, activities involving rating, the bonus-malus system, and contract wording were tightly regulated while such activities are not regulated for many years in United Kingdom (Lemaire, 1997).

Classification variables are usually the tools used to reduce adverse selection, whereas bonus-malus (or merit-rating) schemes are introduced because risk categories lack homogeneity or fairness and because such categories do not really take moral hazard into account (Dionne and Vanasse, 1992). Recent research findings also highlight the role **commitment** plays in bolstering incentives when faced with moral hazard in a bonus-malus scheme (Chiappori et al., 1994; Dionne et al., 2001). It is not clear that the commercially motivated across-the-board deregulation now being proposed in Europe would be the most beneficiary solution for these markets where some sort of commitment is implemented by regulation.

In the economic literature on multi-period contracting, the notion of commitment to the contract by the principal or the insurer plays a significant role on incentives results. The agent or the insured does not have to commit himself to the contract. Under full commitment, the insurer fully commit to a long-term contracting whatever the nature of the results in each period. In other words, the terms of the insurance contract or the bonus-malus scheme cannot be renegotiated at a particular date. Another form of commitment is commitment and renegotiation where the parties sign long-term contracts, but can alter the initial contract whenever this is mutually advantageous to both parties, ex-post: the relationship is essentially restricted to renegotiation-proof contracts (see Dionne and Doherty, 1994, for an application to automobile insurance under adverse selection). Finally, under non-commitment, the relationship between the insurer and the insured is governed by a series of short-term contracts where a bonus-malus scheme has no value (Dionne and Fluet, 2000) since the insureds have no incentive to take into account of this additional incentive scheme.

In fact, the efficiency of competitive markets depends on a large number of characteristics. But these markets must, first and foremost, be transparent to all their participants (a characteristic difficult to achieve when there are information problems). Another important characteristic often neglected by academics and regulators is the parties' degree of commitment to the contract. Dionne and Doherty (1994) have, for example, shown that some form of commitment will inject added efficiency into situations where there is adverse selection in multi-period contracting. They established that a significant number of efficient insurers in California use highballing which involves some form of commitment. However, commitment is not observed in many unregulated competitive markets, especially when moral hazard is present. Parties to the contract are usually highly motivated to re-negotiate the initial contract at the end of the first period, particularly when consumers can easily move from one insurer to another. Under these conditions, regulation can generate a certain form of commitment which may benefit all the participants in the market. Regulation does, in fact, impose some form of commitment on the industry. This form of commitment has recently been discussed as a way of reducing insurance fraud or ex-post moral hazard (Picard, 1995).

In this chapter, I shall give a detailed analysis of two different automobile insurance markets: those of the province of Quebec, in Canada and France. I will also document the Japanese regulatory system and that of other countries in Europe.

In 1978 and 1992, the Quebec market underwent radical changes. In 1978, a pure no-fault system was introduced for bodily injuries. This plan is run by a public monopoly. Property damages are administered by the private sector which is not strongly regulated. Loss reserving is monitored but premium rating and the bonus-malus system are free of regulation. However, in the interest of maintaining competition, each insurer must publish and file a rate manual with the Inspector General's office which must, in turn, produce a detailed report on insurance rates each March. We will show that the private market deals very efficiently with adverse selection, since there is no residual adverse selection in the portfolio of the insurer we studied. Since the great majority of insurers use the same variables, we may suppose that the same results will apply to the whole market. We did not look at moral hazard in this part of the market. We will, however, show that,

under full commitment, the public monopoly has built up a bonus-malus system that effectively reduces moral hazard.

We shall then turn to France where automobile insurance is managed by the private insurance industry. As mentioned above, basic insurance rates are not regulated but the bonus-malus scheme is. We shall argue that this form of regulation adds up to a form of commitment on the part of the industry and that this commitment should reduce moral hazard effectively. This form of bonus-malus, regulated by a law, implies that each insurer must apply the same variations of premiums in function of past experience according to ex-ante rules that cannot be renegotiated whatever the behavior or the experience of the insureds. It cannot be renegotiated by some insurers in order to keep or increase some market share. Indeed, we shall show that the bonus-malus coefficient is significant in explaining both individual risks and individual choices of insurance coverage. We shall also show that insurers in France are successful in eliminating residual adverse selection. So, in a competitive environment, adverse selection does not seem to require tight regulation, but regulated commitment does seem to help control moral hazard in both Quebec and France. It is not clear that the European Commission has taken accurate account of these information problems in proposing its transitional rules for a unified European insurance market. At least, no such considerations have been well documented (Picard, 2000). This state of affairs can be explained by the fact that, until just recently, relatively few empirical studies have been conducted to measure the impact of information problems. (See the recent survey by Chiappori and Salanié, 2000, on the econometrics of information problems.) Finally, we will show that the deregulation of insurance was a major concern for Japanese government over the recent years.

1. The Quebec Automobile Insurance Regime

1.1 Description and Statistics

In December 1977, the Quebec government adopted the *Automobile Insurance Act* which established the new no-fault insurance plan for bodily injuries. In academic circles, this plan is called a "pure" no-fault plan since it provides for no legal action, no matter what the nature of the bodily injuries (see Devlin, 1992; Rousseau-Houle, 1998, and Gauvin, 1998). This plan is run since March 1978 by the Quebec Automobile Insurance Board (henceforth referred to as the SAAQ: Société de l'assurance automobile du Québec), a public monopoly which collects its revenues from car registration fees, drivers licenses, and investments. The objective of the public plan is to compensate for any real economic loss caused by an automobile accident, up to the maximums provided for in the *Automobile Insurance Act*. Health and hospital costs are covered by the other public plans in Canada.

Property damages are administered and paid for by the private insurance sector. The 1978 reform made liability insurance compulsory but kept the right to compensation for vehicular damages under the traditional liability regime. A minimum of $50,000 in liability insurance is compulsory. However this minimum is higher for certain types of vehicles. In 1978, private insurers implemented the principle of awarding direct compensation to victims of property damage. The owner whose car has been damaged through no fault of his own will pursue, not the author of said

damages and his insurer, but rather his own insurer, according to the regulations of the Agreement on Direct Compensation between insurers.

The solvency regulation in Canada is managed by both the federal and provincial governments. The other forms of regulation are in charge of the provinces. The federal Office of the Superintendent of Financial Institution is concerned with solvency of insurance companies registered under federal statues and for insurers incorporated outside Canada. The provincial authority is responsible for the solvency regulation of provincial incorporated insurers.

In 1999, from the 134 insurers having business in Quebec, 59 were registered at the federal level, 24 at the provincial levels (18 in Quebec and 6 from other provinces) and 51 from other countries (Inspecteur général des institutions financières, 1999).

On the whole, residents of Quebec are pleased with the current plan. Various studies have shown that the reform has achieved the objectives set: increased protection of victims, reduction of management costs, substantial decrease in insurance premiums, and a significantly shorter wait to be compensated for bodily injuries or property damage. In 1990, adjustments were made to certain forms of compensation. In 1992, the rate-setting scheme for bodily injuries was modified to include a bonus-malus system based on demerit points obtained from drivers' violations of the Road Safety Code, so that this scheme would be more fair and offer more incentives for road safety.

Over the past twenty-two years, the role of the SAAQ has been expanded in several ways. It is now responsible for traffic safety; it controls access to the road network; and it regulates the road transportation of people and goods. It is also authorized to contribute to the rehabilitation of accident victims.

It would be useful to cite a few statistics at this point (Belleau, 1998). For example, in 1997, automobile owners contributed $87 to the public plan, as against $84 in 1978. In 1997, the SAAQ's 123-million surplus was passed on to vehicle owners through reduced insurance premiums (Gagnon, 1998). The average annual premium of licensed drivers was $14 in 1978 as compared with $20 in 1992. The rate-fixing regime has been criticized as too uniform. Although the 1992 reform does not provide a clearly distinct category for drivers who accumulate fewer than four demerit points, it does offer the advantage of being easily understood. It should be remembered that Quebec's traffic safety record improved considerably during the period in question. And the SAAQ, as overseer of traffic safety, was part and parcel of this improvement. This works to the benefit not only of the SAAQ but also to that of the private sector, since most prevention programs make no distinction as to the types of accidents avoided. It has to be emphasized that the SAAQ reimburses the public health and hospitalization systems for bodily injury treatments. It also reimburse the workers' compensation regime for road accidents that imply drivers at work.

There has been a radical decrease in administration fees. They dropped from a 36.3% pre-reform average to a 16% average between 1978 and 1992. In 1996, they stood at 12% of total claims. As

suspected by many, economies of scale do seem to have a significant effect on administration fees in insurance.

The reform was designed to respond to a number of criticisms generated by the previous plan. The primary source of dissatisfaction was linked to that plan's operating costs. In 1974, 36.1% of all premiums were being managed under the fault-based automobile insurance system. Moreover, 14% of premiums were being used to settle claims and 13.8% to set up and sell insurance contracts (actuarial, research, marketing, ...). These two elements are key to any understanding of the 1978 reform.

Another criticism was linked to the hike in insurance premiums. During the 1961-1971 period, premiums increased on average 6.1% annually, whereas the consumer price index increased by only 40% over the entire period or an average of 4% a year. The culprit was compensation: It climbed from an average of $416 in 1961 to $885 in 1972. But not all victims profited equally from these increases: those with the financial means to hire good lawyers came out ahead.

A third source of dissatisfaction was the number of uncompensated victims. The Gauvin Committee (which sketched the broad outline of the new plan) in fact estimated that 28% of victims with bodily injuries received no compensation at all before 1978. Approximately 40% of victims' losses were never compensated. What is more, compensation regulations were often applied haphazardly. Small losses were underpaid and large losses were overpaid, a clear indication of the role lawyers played in establishing the settlements.

The pre-1978 plan was slow to compensate victims: 42% of claims for bodily injuries were settled a year after the accident. And the average wait for a court date was 725 days. But, in the late-1980s, 32% of compensation claims were handled within a month as compared to only 5% under the previous system of compensation (Fluet and Lefebvre, 1990).

1.2 Analysis of Insurance Rating System

One criticism of the 1978 plan concerned the way insurance rates were set. In 1978, the private sector was still basing its rates on risk categories and driving records. With this dual approach, they could tailor premiums to individual risks (equity and adverse selection, Crocker and Snow, 2000) and encourage drivers to be prudent (moral hazard, Winter, 2000). There is no regulation of the private sector insurance pricing. However, insurers must make their rate manuals available to the *Inspecteur général des institutions financières* (IGIF, General Inspector of Financial Institutions) each year and within ten days after a significant modification.

The private sector uses a traditional classification system for pricing property damage and collision insurance, based on demographic characteristics, profession, group characteristics (union, employer, ...), automobile use (vehicle driven to work or not, for business or farm purposes, and kilometers), territory, type of car and past experience. The primary demographic variables are age, sex and marital status. For pleasure vehicles, pricing is based on territory, driver's class, past experience and car group. For other vehicles, driver's classes are not used, but the categories of vehicle are important. Driving experience is measured by the number of years of

accidents free driving since the last accident. Some insurers used accidents at fault, others use all accidents.

Insurance premiums increase with the number of past accidents. However, the rate varies from one insurer to another. For example, if in the previous three years, an individual was responsible for three accidents, the premium is increased by about 30% and, for each additional accident, by 10%. Convictions for driving violations are also used. For example, four convictions for speeding and other types of traffic violations increase the premium by about 25% and for each additional conviction, by 15%. The application of these rules is not always uniform across insurers, however.

In an analysis of eight bonus-malus systems around the world, Lemaire (1985) has shown that the Quebec system ranks among the lowest in terms of 'efficiency'. However, it has a better performance with regard to the relatively stationary average level index. The "relatively stationary average level index" is an index that determines the relative position of the average policy holder in the portfolio. A low value indicates a high concentration of policies in the high-discount bonus-malus classes. A high value suggests a better spread among the risk classes.

Lemaire (1985) also describes how the Belgian third-party a posteriori rate scheme was set up in 1971: the rate scheme was a bonus-malus structure prescribed by the Government even thought the insurance was supplied by the private sector. This could be an efficient way to reach the desired social level of road safety because it implies the industry's strong commitment to the pricing scheme. As we shall see later, the same system applies in France. However, there is strong competition in ex-ante pricing in France, while in Belgium this aspect was also regulated, until the 1990's.

We must add that the rating classes used by insurers in Quebec screen very efficiently for adverse selection. In fact, as shown by Dionne, Gouriéroux, and Vanasse (2001), there was no residual adverse selection in the portfolio of an insurer from which they obtained all the data for a given year. As would any other participant in that market, the insurer studied uses many classification variables to obtain homogeneous classes of risk. So there remains no asymmetry in information between the insurer and the policy-holder when the contract is signed. The detail of this type of analysis will be presented in the next section where the same methodology was applied to a sample of drivers in France. Puelz and Snow (1994) obtained a contrary evidence for the US but their methodology is discussed in Dionne, Gouriéroux and Vanasse (2001) and in Chiappori and Salanié (2000).

In practical terms, there is strong competition and no regulation of pricing activities for property damages in Quebec. In 1994, the 20 biggest insurers represented 78.5% of the automobile insurance market while about 50% of the market was controlled by four insurers. If an insurer finds a new combination of rating variables, he will hold a market advantage for at most one year since, in order to maintain strong competition, he is obliged to deposit his new rates manual at the office of the Inspector General.

The public insurance for bodily injuries set up in 1978 computed its rate uniformly, totally independent of individual risks and incentives (Boyer and Dionne, 1987). In other words, each permit holder paid the same amount to be insured. In December 1992, the SAAQ introduced a new rate-setting scheme based on the accumulation of demerit points. It was thought that such a system would improve traffic safety if individuals were encouraged to drive more carefully. The Quebec public insurer finds this rate-setting scheme easy to apply, since it is responsible not only for bodily injuries but for traffic safety as well: It thus has full access to information on traffic violations, revocations of drivers licenses, and accidents involving injuries and deaths. It also has information on any accidents with property damage having required an accident report.

Table 1-1 shows the evolution of the contributions of licensed drivers in function of past demerit points over a two-year period.

Table 1-1 Variation in biennial insurance payments for 1992, according to the number of demerit points accumulated during the two previous years

Number of demerit points accumulated	Insurance payments	Distribution of permit holders
0 to 3	$40	90%
4 to 7	$90	10%
8 to 11	$164	
12 to 14	$276	
15 +	$398	

Boyer and Dionne (1987) had already shown that, inserted in a Probit model, the number of demerit points accumulated over a two-year period are significant in predicting the accident rate for the current year. They also found that the number of suspensions accumulated during the year preceding renewal of the license was significant in explaining the number of accidents during the following year.

These findings were confirmed by subsequent studies. Specifically, it has been shown that the findings were robust enough to stand up to the use of various econometric models including those from the count data family (Dionne, Vanasse, 1997).

These preliminary findings, that link past demerit points to current accidents, are interesting because they can be used to test for a fundamental condition required to establish a rate scheme based on past experience. If the demerit points accumulated do not provide sufficient statistical grounds for evaluating current prevention activities, they cannot be used as rate-setting variables. However, these findings cannot be used as grounds on which to predict the effect demerit points will have on traffic safety. In other words, they are not sufficient to conclude for the presence of moral hazard. There is, in fact, no indication from these preliminary results, that any particular

policy of rate-setting will change the behaviour of licensed drivers. Further research is necessary and some results are now presented.

One objective of introducing a bonus-malus system was to encourage individuals to be more prudent. When the insurer has no control over safe driving, insurance tends to lower the precautions policy-holders will take to prevent an accident. As a rule, insurance coverage reduces the private benefits of prevention and protection without modifying their cost. The policy-holder is thus less motivated to take precautions and this increases the frequency (and seriousness) of accidents (Winter, 2000).

There are several ways of dealing with the distortion this type of moral hazard introduces into insurance mechanisms. The first has to do with the way insurance contracts are actually drawn up (see the synthesis in Winter, 2000). The policy-holder may be persuaded to take greater precautions than moral hazard would imply if only partial coverage is offered (by means, for example, of deductibles). As the insured person remains exposed to some degree of uncertainty, he has more reasons to be cautious than under a contract covering all risks. Moral hazard presents to the policy-holder with a trade-off between risk coverage and efficiency for prevention.

Another way that the insurer can reduce moral hazard is to acquire information on the policy-holder's behaviour with regard to prevention. This information may be acquired ex ante, that is prior to the signing of the contract, or ex post, from the investigation of accidents or traffic violations. However, as the information is costly and imperfect in both cases, this also justifies offering only partial coverage.

The information obtained about the policy-holder's behaviour with regard to prevention can also be used to push for greater prudence by offering contracts whose premiums are adjusted to the number of accidents observed in the past or the number of traffic violations accumulated.

The bonus-malus system is an a posteriori complement to the a priori fixing of insurance rates. On the one hand, it corrects the imperfections of risk categories based on imperfect criteria. Specifically, it allows the insurer to make the risk categories more homogeneous, as a priori categorization of risks mitigates the inefficiencies caused by adverse selection and imperfect information. On the other hand, it motivates caution and reduces the distortions associated with moral hazard.

Finally, we observe that the bonus-malus system is often used for reasons of equity, so that each policy-holder will pay a premium corresponding to his own risk level. Joining this argument to those arising from problems with information, the SAAQ decided to re-introduce a bonus-malus system (1992) into its pricing scheme for bodily injuries. Note that, in computing its premiums, the SAAQ uses the demerit points associated with traffic violations rather than information associated with accidents. We must also add that the promotion of highway safety is also based on education driving access standards and monitoring.

1.3 Study of the Effects of the New Rate-Setting Scheme on Accidents

Dionne and Vanasse (1997) analyzed the effects of the new rate-setting scheme on accidents. Overall the number of persons killed on Quebec roads decreased from more than 2,000 a year in the early 1970 (1,792 in 1979 to 882 in 1995) to 752 in 2000, even through the number of vehicles had more than doubled from 2 million in 1970 to 4.4 million in 1997. From 1980 to 1992, the number of fatalities per kilometer decreased by 58% in Quebec as compared to 50% in Germany and 48% in the United States (Gagnon, 1998).

The reform's incentive-component can be measured by comparing the evolution of accumulated violations of the road safety code and accidents before and after the 1992 reform. It is possible to see if the introduction of the post-1992 rate-setting scheme had any effect on the number of violations and accidents accumulated. But several methodological difficulties may stand in the way.

The first methodological difficulty consists in isolating what effect the change in regulation might have had on the behaviour of drivers. Though the sample used is representative of all licensed drivers in Quebec before and after the reform, several observations (not necessarily all simultaneously, because we are dealing with an incomplete panel data set) may be influenced (in various ways) by other factors and regulations over the period studied. For example, the regulation for new drivers was modified in 1991. It affects the behaviour of all new drivers during their first two years of driving. New drivers having obtained their first drivers license post-1991 have a probationary license. The main characteristic of this license is that it takes only ten (rather than fifteen) demerit points to have it revoked. New drivers may thus be better post-1991 and thereafter. However, the new regulation was less severe for entry on the market or to become a new driver, so the net effect is ambiguous. This example is a good illustration of the need to control for the various forms of private and public insurance regulations applied during the period studied. Another example is raising the limit for a license suspension from twelve to fifteen points for all drivers in January 1990. In fact our study had to take into account all major regulatory changes as well as the aggregate exposure-to-risk factors that shape the motorist's environment.

The economic situation opens up another dimension. The unemployment rate can, for example, have a negative impact on the accident rates of new male drivers and higher gas consumption can positively affect the accident rate for all drivers. These relationships indicate that the economic situation also has its influence on the accident rate. It will thus also have to be accounted for, even though our data base is only a sample.

The exogenous nature of the 1992 change in regulation is also open to question. Using a dummy variable to measure a change in regulation poses no methodological problem if this change is exogenous to the participants in the market. Since the study used individual data on policy-holders whose market shares are very small, we could easily suppose that, for the policy-holders studied, the 1992 change was perfectly exogenous.

The test proposed is similar to a laboratory test, if we suppose that the legal and economic environment is carefully controlled. With the 1992 change, the public insurance plan switched from a pricing scheme that offered no incentives to act prudently to an incentive scheme using demerit points to set insurance rates, while still the same types of coverage. The 1992 change in the rate-setting scheme will thus be shown to have a significant effect on traffic safety if, and only if, we observe, for each period, a reduction in the accidents and violations accumulated-the two variables thought to be accurate measurements of individual risks.

Finally, the authors of this type of research must carefully track the temporal evolution of accidents and violations, mindful that it may simply be part of a temporal trend.

Dionne and Vanasse (1997) have found empirical evidence that the new rate-setting scheme does encourage motorists to drive more carefully. The new scheme actually reduces the number of traffic accidents and violations. This finding also confirms the theory that safety code violations are a good measure of non-observable driver behaviour. In other words, this finding indicates that violations are an appropriate reflection of the way drivers behave. The age of the drivers is controlled in this study.

Dionne, Maurice, Pinquet, and Vanasse (2001) propose additional analyses in the form of a test to isolate the incentive component of the findings or to confirm that there actually is a reduction of moral hazard. They find that traffic violations have declined more quickly than accidents since 1992. This finding seems to reinforce the interpretation suggesting a reduction of moral hazard. But it may also be explained by the fact that drivers are more likely than before to contest a ticket or that police offices are less motivated to give tickets following the 1991 significant increase in fines. Given that the new rate-setting scheme increases the total cost of a violation, it is possible that the drop in violations with convictions (the only data available from the SAAQ) may be due to the fact that tickets are more frequently (and successfully) contested.

This difficulty does not compromise the positive impact of the new regulation on traffic safety, because accidents really have declined; however, it does make the interpretation of the findings more difficult.

To obtain the results in Table 1-2, the authors (Dionne et al., 2000) constructed a panel data set with intertemporal individual data. In fact, they had a panel covering the period from January 1, 1983 to December 31, 1996. The panel was incomplete since individuals can enter or leave the panel when they enter or leave the market.

A first sample of 40,000 licensed drivers was randomly selected on April 1, 1983. Then, in order to keep an age structure including a sufficient number of young drivers, a new random sample of young drivers was added each year.

For each driver, information was available from four data bases: information on individuals' characteristics available on driving permit during the current year, and information on accidents, demerit points, and suspensions during the current year and the two previous years when available (details are in Dionne et al., 2001).

Table 1-2 Maximum likelihood negative binomial with random effects. Dependent variable: number of accidents*

Variables	Coefficient	t-statistic
Intercept	-0.86841	-3.855
Sex of the permit holder		
Sex (M=1)	0.67986	42.215
Age of the permit holder		
16 years old	0.15155	1.926
17 to 19 years old	Omitted category	
20 to 24 years old	-0.14283	-2.976
25 to 34 years old	-0.46517	-7.329
35 to 54 years old	-0.66377	-9.979
55 to 64 years old	-0.76985	-10.767
65 years old and more	-0.83142	-11.195
Permit holder's place of residence		
Bas St-Laurent	-0.02468	-0.559
Saguenay Lac Saint-Jean	0.25058	7.094
Québec	0.21620	8.183
Mauricie Bois-Francs	0.15031	5.254
Estrie	0.14333	3.999
Montréal	Omitted category	
Outaouais	0.22433	6.175
Abitibi-Témiscamingue	0.18037	3.980
Côte-Nord	0.32926	6.056
Nord-du-Québec	0.03641	0.285
Gaspé, Iles-de-la-Madeleine	-0.04439	-0.701
Chaudière-Appalaches	0.04407	1.377
Laval	-0.03561	-0.980
Lanaudière	0.10201	3.217
Laurentides	0.10567	3.482
Montérégie	0.11066	4.992

Variables	Coefficient	t-statistic
Driving license class		
1 Heavy truck	-0.00805	-0.171
2 Bus with more than 24 passengers	0.21586	3.956
3 Truck < 4500 kg	-0.01185	-0.202
4a Emergency vehicle	0.16025	1.810
4b Bus with less than 24 passengers	-0.67748	-7.285
4c Taxi	0.93323	16.266
5 Car	Omitted category	
6A Moto without restriction	-0.00287	-0.134
6B Moto 400cc and less	0.34558	2.898
6C Moto 125cc and less	0.22673	1.017
6D Moped	-0.62757	-2.651
Experience		
Less than 1 year of experience	-0.04006	-0.522
1 to 3 years of experience	0.04610	1.040
3 to 5 years of experience	Omitted category	
5 to 10 years of experience	-0.09693	-3.393
10 years and more of experience	-0.18378	-5.262
Risk exposure		
Days 1983	0.00339	15.900
Days 1984	0.00224	18.763
Days 1985	0.00339	16.126
Days 1986	0.00222	14.124
Days 1987	0.00305	14.909
Days 1988	0.00226	11.750
Days 1989	0.00249	12.113
Days 1990	0.00218	9.676
Days 1991	0.00255	12.933
Days 1992	0.00209	8.827
Days 1993	0.00235	12.074

Variables	Coefficient	t-statistic
Days 1994	0.00247	9.763
Days 1995	0.00225	15.369
Days 1996	0.00237	9.142
Unemployment rate (% annual)	-0.00901	-1.865
Aggregate gas sold (10e6 liters)	0.31184	3.725
January 1990 (15pts)	-0.02102	-0.372
New drivers (1991)	0.18259	2.755
Driving license suspensions	0.27839	6.682
Accumulated demerit points		
0 to 3 accumulated demerit points	Omitted category	
4 to 7 accumulated demerit points	0.38363	8.246
8 to 12 accumulated demerit points	0.35130	3.838
12 to 14 accumulated demerit points	0.87341	5.169
15 and more accumulated demerit points	0.67115	2.235
Trend	-0.04992	-2.299
Law*trend	-0.01644	-3.020
Parameter a (Beta Distribution)	73.37666	11.195
Parameter b (Beta Distribution)	2.07713	33.490
Log-Likelihood	-101,772.4918	
Number of individuals	42,863	
Number of observations	295,600	

* See Appendix C for a description of the variables.

Table 1-2 clearly shows that traditional rating variables such as age, sex, experience, risk exposure and territory, are very significant in explaining individuals' risk. So they must be used for risk classification at the beginning of the contract period. It also indicates that the past experience variables corresponding to the classes of demerit points presented in Table 1 are also very significant in explaining individuals' accident rate.

But more significantly for our purpose, we observe from Table 1-2, that the variable Law*Trend has a negative coefficient. The coefficient of the trend variable indicates that accidents have decreased by about 5% a year since 1984 and that the interaction variable (Law*Trend) has accelerated decrease in the trend. Similar results were obtained for demerit points.

Two interpretations are possible. The first, related to adverse selection, is that the new pricing scheme may have eliminated bad risks from the market (Dionne, Doherty and Fombaron, 2000). However, this interpretation does not seem very plausible because insurance is compulsory in this market. Since demerit points are a direct measure of drivers' traffic violations, the results appear to be more strongly related to a reduction in ex-ante moral hazard. (See Dionne, Maurice, Pinquet and Vanasse, 2001 for further tests of the moral hazard interpretation.)

2. The French Automobile Insurance Regime

2.1 General Description

Since July 1994, the European Union tries to implement a single insurance market for its 15 current members. The goal of the integration of financial services, including insurance, is to permit supplies in the European Union without any anti-competitive restriction.

Free movement of capital between countries is implemented since 1988 and it was decided to regulate solvency at the European Union level. The new regulation assigns to the country of domicile the authority to verify solvency on the insurer's entire area of activity. The solvency certificates have to be recognized by all participating nations. Taxation, contract law and technical reserves are still kept by individual states (see Appendix A for more details).

Car owners may choose between two types of insurance in France: third-party insurance which is compulsory and comprehensive insurance which includes third party insurance (Richaudeau, 1998, 1999). Third-party insurance covers property damages and bodily injuries to a third party when the driver is at fault (totally or in part). Comprehensive insurance includes third-party insurance but also covers damages to the insured car when the policy holder is at fault. Both coverages are usually taken from the same insurer. About 53% of the vehicles are covered by comprehensive insurance. Other coverages are not compulsary but remain available for theft or fire (vandalism) and for injuries to a driver who is at fault (only 50% take this protection). According to Richaudeau (1998), in 1996, 73% of accident victims were drivers: 42.4% were fully compensated and 12.1% partially compensated by third-party liability. The reminder (45.5% or 60,000 individuals) received compensation only if they were covered.

Insurers propose various deductibles for optimal collision insurance which are not legally available for third-party insurance. They are proposed as the insurers keep the obligation to indemnify completely the third-party and must recover money from the customers. Deductibles can be fixed, proportional or mixed (partly fixed and partly proportional). They vary from one guarantee to another. Insurance premiums are based on different factors. First, ex-ante premiums are set according to car, geographical and driver characteristics. There are no regulations governing this aspect of pricing. Premiums are then adjusted by a bonus-malus coefficient that takes into account the driver's past experience whether or not he is liable (fully or in part). This multiplicative bonus-malus scheme is the standard from one insurer to the next since it is fixed by a law. In that sense, the scheme's incentive pricing has the industry's full commitment. As we

shall argue, this characteristic is very instrumental in obtaining the desired incentives under moral hazard.

Many methodologies can be used to estimate the individual's expected number of accidents. In a first stage, models are used to:

a) Identify significant risk classification variables.
b) Determine rate classes.
c) Calculate premiums (*a priori* model).

The classes obtained are usually not homogeneous and may generate a ratemaking structure that is unfair to the insured driver. Moreover, risk classification does not take moral hazard into account. In order to reduce the gap between the individual's premium and risk as well as increase incentives for road safety, the individual's past record must then be taken into consideration under a bonus-malus system (*a posteriori* model).

The French bonus-malus system was defined by law in 1976. The actual regulated system has been compulsory since 1991. As already mentioned, this is a multiplicative system. the initial coefficient is equal to one and is increased by 25% following an accident with full liability (12.5% otherwise). For drivers with no such accidents, the coefficient decreases by 5%. The total premium is the product of the premium determined by risk classification multiplied by the bonus-malus coefficient. However, the coefficient cannot be lower than 0.5 nor higher than 3.5. Thirteen accident-free years are required to obtain the maximal bonus and after two years without accident the coefficient cannot be higher than one. Finally, since 1991, the first accident does not count for those who stay at 0.5 for more than three years. More severe penalties are possible for accidents with risky behaviour (alcohol, suspended license, etc) (see Richaudeau, 1998, for more details).

One important characteristic of this bonus-malus scheme is that it is transferable from one insurer to another. Moreover, the new insurer can use any a priori pricing for his clients before applying the bonus-malus coefficient. In that sense, there is competition among insurers even if they have to apply the same bonus-malus rules to their policy-holders. It is based on these grounds of competition and transparency that French insurers try to convince the European Community that their bonus-malus system should not be eliminated (Picard, 2000).

One significant advantage of this bonus-malus system is its simplicity. It is easily understood by the insureds and they are pleased with the actual system. In fact, it facilitates switching from one insurer to another and guarantees the sort of commitment needed from insurers to obtain the desired incentive for reducing moral hazard. Insurers also like the present system. It is a source of reliable information on individual risk that would be difficult to acquire otherwise. It allows for more technical competition on costs. Finally, the regulation is fair and transparent: two extremely desirable ingredients (Skipper and Klein, 2000).

2.2 Efficiency of the Pricing System

As already discussed, France's automobile insurance market is highly competitive. Insurers may propose whatever ex-ante pricing rule they choose. The rating variables may contain past experience variables. However, standard bonus-malus rules are spelled out by law.

In this section, we present preliminary results obtained from a sample of consumers covered by different insurers. Drawn from a paper by Dahchour and Dionne (2000), these results emphasize the information value of the bonus-malus scheme and show the efficiency of this pricing scheme in eliminating residual adverse selection.

The first objective was to see whether risk categories retained any residual adverse selection once risks had been classified. It was, in other words, a matter of checking to see whether the information asymmetry existing when the contract is signed can be adequately accounted for by what the insurer already knows about the driver's profile or whether the driver's choice of coverage or deductible adds anything to the assessment of risks. This research extends the methodology of Dionne, Gouriéroux, Vanasse (2001) to panel data. (See also Chiappori and Salanié, 2000, for an analysis of the French automobile insurance market. They obtained similar conclusions on adverse selection by using a different methodology and a different source of data.)

The Dionne–Gouriéroux–Vanasse adverse selection model consists in verifying whether the ex-ante risk categorization efficiently eliminates residual adverse selection in insurers' portfolios. It tests whether insureds' decisions on insurance contract parameters reveal any information on individual risk, as suggested by Rothschild and Stiglitz (1976). Here we use the choice between comprehensive coverage and third party insurance. It is usually claimed that bad risks buy more insurance coverage than good risks. The same results were obtained with the choice of deductible for collision insurance. So we estimated a Probit model with panel data over three years. The data come from the *Parc Automobile de la Sofres* survey, from which many questions on road safety and automobile insurance coverage are used for research by INRETS.

It contains variables relating to:

- Drivers: age, kind, accidents, ...
- Vehicles: year, group, kilometrage, ...
- Automobile insurance contracts: bonus-malus coefficient, choice of insurance coverage
- Casual users

A panel was constructed based on the 1995-1996-1997 waves of the survey.

On a single-period analysis, the test proposed by Dionne, Gouriéroux, and Vanasse (2001) consists in verifying whether individuals' accidents during the contractual period are significant in explaining the insured's choice of contract. If the answer is positive, this means that the risk categorization system does not provide insurers with all the private information they need on the individual risks and that possible residual adverse selection will be present in the portfolio. (On risk classification, see Crocker and Snow, 2000). If the answer is negative, this means that we can

reject the presence of asymmetrical information between insurer and insured at the contracting date. This procedure has to be applied properly in order to eliminate any conclusion that may stem from mispecification of the econometric model. So it is appropriate to add the expected number of accidents in the model. This variable is usually computed based on the estimated parameters for accident distribution. If this variable is statistically significant, this means that the specification retained has not been sufficiently elaborated. However, it will not reveal any private information since any insurer can use observables to compute the individuals' expected number of accidents.

When the expected-number-of-accidents variable is itself non-significant, it is thus confirmed that the explanatory variables render risk classification accurate enough to provide full information on individual characteristics prior to signature of the contract. Otherwise, additional variables must be added to the model.

The use of panel data permits us to monitor for information contributed by the bonus-malus clause. Dahchour and Dionne (2000) took certain characteristics of the French automobile insurance market into account in order to make the model fit that reality.

The main characteristics of the French automobile insurance market that were taken into account are explicitly the following:

- When the driver is at fault in an accident this is, to a certain extent, public information, since rival companies will learn of it from the information the subscriber is obliged to provide when purchasing the insurance contract or changing insurer.

- Information on former purchases of contracts (type of coverage and premiums paid) is quite public.

- Exclusivity of contract purchase: one insurer for all coverage.

- High-risk subscribers are subsidized by low-risk subscribers: artificial inflation of insurance premiums is most often cited as one of the perverse effects of the French bonus-malus system. New drivers are most affected by such inflation.

- Commitment on the part of the insurer (or the industry) on the bonus-malus scheme.

The existence of the single and regulated bonus-malus clause establishes something of a dynamic link between the policy-holder and his insurance company: the insurer makes a commitment only on the formula of evolution for the bonus-malus, so long as the driver does not change insurance company. So the industry offers commitment on the bonus-malus but no form of commitment on the basic insurance rules if the driver leaves his insurer for another.

Insurance contracts contain no clauses obliging drivers to stay with the same company beyond the period covered by the contract. This being so, the hypothesis of policy-holders' non-commitment

is retained, even though satisfied clients tend to stay with their company for as long as possible. However, a commitment by the insured is not necessary to obtain the desired incentive effect.

The test proposed is based on a two-step estimation by using individual panel data1. The first step estimates the accidents distribution for each period to compute the expected number of accidents, whereas the second estimates the likelihood of choosing comprehensive coverage over third party coverage. In the second step, the expected number of accidents obtained with the first estimation is included in the list of explanatory variables. This type of estimation is known to give convergent estimators in the second step.

In Table 2-1, a very limited specification of the model is presented. We observe that the number-of-accidents (NBACC) variable has a positive and significant coefficient. This means that bad risks choose the higher insurance coverage as predicted by the models of Rothschild and Stiglitz (1976) or Wilson (1977). But this result can be explained by a specification error.

Table 2-1 Random-effects Probit model.
Dependent variable: choice of insurance coverage*

	Coefficients	St.devi.	T-stat	P-value
Constant	4.1469	620.9680	0.0067	0.9947
NBACC	**0.1787**	**0.0651**	**2.7460**	**0.0060**
T	-0.2941	0.0450	-6.5375	< 0.0000
Rho	0.9852	6.3974	0.1540	0.8776
Probability Log	-8,272.13			
Number of observations	16,399			
Number of individuals	11,506			

* NBACC: number of accidents during the contract; T: time variable; Rho: Time correlation measure; St.devi.: standard deviation; T-stat: t of student; P-value: degree of significance. A coefficient is significantly different from zero at a degree of confidence higher than 95% when $P \leq .05$.

In Table 2-2, the expected number of accidents (variable ENBACC) is added to the model. We observe that the coefficient of the accident variable is no longer significant which means that

[1] Individual panel data offer several advantages over aggregate data: elimination of biases linked to aggregation and thereby production of more sharply defined estimators; more accurate measurement of certain variables; individual heterogeneity making it possible to go beyond the notion of the representative agent and thus favoring the search for better econometric modeling to take it into account.

there is no residual asymmetrical information (or residual adverse selection) between the contracting parties at the beginning of the contract period or when risk classification is done.

Table 2-2 Random-effects Probit model. Dependent variable: choice of insurance coverage with ENBACC variable*

	Coefficients	St.devi.	T-stat	P-value
Constant	1.1227	0.1368	8.2050	< 0.0000
NBACC	**0.0793**	**0.0712**	**1.1130**	**0.2658**
ENBACC	**8.3124**	**0.3390**	**24.5230**	**< 0.0000**
T	-0.1345	0.0410	-3.2760	0.0011
Rho	0.9644	0.0027	359.8860	< 0.0000
Probability Log	-8,137.47			
Number of observations	16,399			
Number of individuals	11,506			

* NBACC: number of accidents during the contract; T: time variable; Rho: Time correlation measure; St.devi.: standard deviation; T-stat: t of student; P-value: degree of significance; ENBACC: expected number of accidents obtained from the estimated parameters of the negative binomial model presented in Appendix B.

The expected number-of-accidents variable remains significant in Table 2-3 even after introduction of the classification variables and the bonus-malus variable. This proves that some non-linearities linked to insurance rates have still not been taken into account. To eliminate these non-linearities, it is a matter of finding the right crossovers between classification variables.

Nevertheless, Dahchour and Dionne (2000) come to the same conclusion as in Dionne, Gouriéroux, and Vanasse (2001): the policy-holder has no informational advantage over his insurer. Therefore, taking the dynamics of the relationship into account confirms this conclusion without managing to eliminate completely all the non-linearities linked to insurance rates.

As for the bonus-malus, its coefficient is significant in Tables 2-3 and 2-4 (in Appendix). Dahchour and Dionne predicted a negative coefficient in the insurance choice equation: a policy-holder with a bad past experience is the signal of a bad driver. Here (i.e. in the choice-of-insurance equation), the bonus-malus is like a price variable: policy-holders choosing comprehensive coverage pay a lower premium because their bonus-malus coefficient is low, while the contrary is true for those choosing third-party liability insurance only.

Table 2-3 Random-effects Probit model*.
Dependent variable: choice of insurance coverage with ENBACC and BONMALUS variables

	Coefficients	St.devi.	T-stat	P-value
Constant	0.8815	0.6063	1.4538	0.1460
NBACC	**0.0944**	**0.0688**	**1.3732**	**0.1697**
ENBACC	**6.9177**	**0.4548**	**15.2118**	**0.0000**
BONMALUS	**-3.7286**	**0.1517**	**-24.5783**	**0.0000**
T	0.0903	0.0361	2.4993	0.0124
Rho	0.8953	0.0065	138.1420	< 0.0000
Probability Log	-6,697.21			
Number of observations	16,399			
Number of individuals	11,506			

* NBACC: number of accidents during the contract; T: time variable; Rho: Time correlation measure; St.devi.: standard deviation; T-stat: t of student; P-value: degree of significance; ENBACC: expected number of accidents obtained from the estimated parameters of the negative binomial model presented in Appendix B; BONMALUS: bonus-malus coefficient. Note that this regression was made with 29 additional control variables. Details are in Dahchour and Dionne, 2000.

In table 2-4 (Appendix B), the bonus-malus has a positive and significant coefficient, thus confirming the following prediction: a bonus-malus is also a reliable source of information on the type of risk involved. This information is contained in the ENBACC variable of Table 2-3.

3. Automobile Insurance in Japan

3.1 General Description

There are two types of automobile insurance coverage in Japan: voluntary automobile insurance and compulsory automobile liability insurance (CALI).

The Automobile Liability Security Law was enacted on December 1, 1955 to provide financial security to traffic accident victims and to control the premium rates. Under this Law, a Compulsory Automobile Liability Insurance (CALI) policy was initially marketed in February 1956. This compulsory policy covers liability for bodily injury to traffic accident victims.

Before the Automobile Liability Security Law, tort liability procedures for automobile accidents had been based mainly on the Civil Code, under which a victim could only claim damages after he had succeeded in proving that the other party was at fault.

By substituting the legal concept of "responsibility for no-fault" of that of "responsibility for negligence", the Automobile Liability Security Law sought to strengthen victims' rights. Under this rule, damages can be claimed, if the victims or their heirs can prove that injury / death was caused by a traffic accident.

Under the law, a driver is responsible for tort liability claim unless he/she is able to prove the following three points: a) he was not negligent in operating the vehicle; b) there was negligence on the part of the victim or a third party; c) there was neither structural or malfunction in his/her vehicle.

The limits of insurers' liabilities are legally stipulated for death, for different grades of permanent disability, and for other bodily injuries. These limits of liability are applicable for each victim, but there is no total limit per occurrence. After payment of a claim the limits of an insurer's liability remain unchanged for the remainder of the policy period. In the case of a fatal accident, however, the insurance company requires the policyholder to pay an additional surcharge premium on a pro rata basis for the remaining period of his policy.

The limits of insurers' liability have been increased periodically to reflect the prevailing economic and social conditions. The current scheme of coverage (1999) is as follows: Death: 30 million yen; Permanent Disability: 30 million yen (1st grade) ~ 0.75 million yen (14th grade); and Bodily Injury: 1.2 million yen.

The premium portfolio of all CALI contracts, except for policies for motorcycles of 125 c.c. or less in displacement, is reinsured en bloc with the government on a 60% quota share basis. The remaining 40% is placed in a private CALI Pool and is shared by all non-life insurance companies operating CALI business.

Since the acceptance of all CALI risks is obligatory, the purpose of this pooling arrangement is to prevent possible deterioration in the operating results of any individual insurer and to distribute bad risks equitably among all insurers.

The Automobile Insurance Rating Organization system of Japan was established in 1964. This system was established under the Law concerning Non-Life Insurance Rating Organizations and focused its attention on the calculation of reference pure risk premium rates for voluntary automobile insurance and a standard premium rate for Compulsory Automobile Liability Insurance (CALI). It maintains survey offices at major cities throughout the nation for settlement of CALI claims. Membership includes 34 domestic and 18 foreign companies. Two or more non-life insurance companies may, with the approval of Financial Reconstruction Commission, establish a rating organization. Rating organizations calculate reference risk premium rates and standard premium rates for their members. They notify the new rates and any alteration to the Commission. The Commission examines the new rates within 30 days and objections on their application may be raised. The rating organizations are supervised by the Commission which may suspend their activities.

From a peak of 16,765 in 1970, the number of deaths from traffic accidents had declined steadily to 8,466 in 1979. However, after 1979, the negative trend resumed with the number of deaths exceeding 10,000 in 1988. After 1993, the annual number of deaths began to decline again with fatalities dropping below the 10,000 level for 3 consecutive years from 1996.

In 1998, the number of traffic accidents involving bodily injuries reached 803,878, with 9,211 people killed and 990,675 people injured. The number of traffic accidents in Japan had fluctuated until 1991, but since then, the total has increased each year and the figure for 1998 is the highest on record, with the number of people injured also the highest in 28 years. Consequently, the Japanese are faced with a severe traffic accident problem.

3.2 Recent Regulatory Changes

3.2.1 Improvement of Loss Survey Method for Compulsory Automobile Liability Insurance (CALI) (April 1998)

The Japanese non-life insurance market was subject to different forms of deregulation since 1996 as an integral part of the Japanese financial reforms (Big Bang). In the CALI field, the Automobile Insurance Rating Organization of Japan, a neutral independent body, conducts loss surveys, and the results of the surveys are used by non-life insurance companies in deciding the ultimate amount of claims payment. As from April 1998, the Organization has established a "Board of Examiners" and a "Board of Reexaminers" to recognize the degree of permanent disability, and, in fatal accidents, the negligence of victims involved, thus improving its examination structure so that the loss survey could become even more just and fair, as well as objective and transparent.

In this relation, as from April 1998, non-life insurance companies not only have cooperated with the Organization in implementing the improvement measures mentioned above, but also have taken their own measures to improve the situation concerning loss surveys, thus making every effort to offer a fine-tuned response to victims and other claimants.

3.2.2 Financial System Reform Bill Approved by the Diet (June 1998)

On March 13, 1998, the Financial System Reform Bill was submitted to the Diet, and, after passing on June 5, was published on June 15, 1998.

The Bill amended en bloc 24 finance-related laws, such as the Insurance Business Law, the Law concerning Non-Life Insurance Rating Organization, the Securities and Exchange Law, the Banking Law, etc. Thus, a framework was put in place for a sweeping reform of Japanese financial systems. The Bill, except for only a few sections, was enforced on December 1, 1998.

3.3.3 Financial Supervisory Agency Established (June 1998)

On June 22, 1998, a Financial Supervisory Agency was newly established and is responsible for the inspection and supervision of financial institutions, including insurance companies.

From the viewpoint of transparency and securing fairness and equity in financial administration, the Financial Supervisory Agency is independent and separate from the existing Ministry of Finance, and takes over the inspection and supervisory functions of the Ministry of Finance, such as the issuance of orders to improve / suspend the business operations of financial institutions.

In line with the above change, the Ministry of Finance currently carries out such functions as policy planning, research and study relating to the overall financial system, and the establishment and repeal of finance-related laws and regulations.

a. There are two insurance advisory councils: the Financial Council to the Minister of Finance and the Compulsory Automobile Liability Insurance (CALI) Council to the Commissioner of the Financial Supervisory Agency.

b. The Financial Council was established by combining three former councils (the Financial System Research Council, the Insurance Council, and the Securities & Exchange Council), in line with the reorganization of the supervisory structure in June 1998.

c. The CALI Council established under the Automobile Liability Security Law which was introduced in 1955. The CALI Council is currently composed of 13 members, and it is exclusively responsible for matters related to CALI.

d. As advisory organs to the administrative bodies, these councils shall, at the request of the Minister or the Commissioner, discuss possible ways and means to improve the financial system, including the business affairs and administration of the insurance industry and matters related to CALI.

Moreover, as an integral part of its deregulation requests to the government, "Keidanren", the Japan Federation of Economic Organizations, requested the abolition of the government reinsurance scheme for Compulsory Automobile Liability Insurance (CALI) in October 1998. Furthermore, the issue of privatization of the CALI system was taken up during discussions on the reform of the central ministries, etc. in October 1998. With due regard for these circumstances, a CALI Ad Hoc Committee was established in December 1998, in order to review the CALI system as a whole.

One fundamental position includes maintaining as currently the compulsory nature of the insurance, the obligation of insurance companies to provide CALI contracts, and the no-loss and no-profit principle. At present, the CALI system as a whole is being deliberated at the round table of the CALI Council, especially as concerns protecting traffic accident victims, streamlining CALI administrative procedures, reviewing the CALI government reinsurance scheme, etc.

On the other hand, separately from the CALI Council deliberations, the Ministry of Transport, in February 1999, established its own round table on the future direction of the CALI system as a whole. The discussions were concluded at the end of September 1999, and their results then reported to the round table of the CALI Council held on October 7, 1999.

In June 2000, the CALI Council submitted a report on the new direction for the CALI system. The non-life insurance industry has welcomed the report that indicates which future deliberations should proceed on the CALI system as a whole and concerning the abolition of the CALI government reinsurance scheme in the near future.

Finally, the Insurance Business Law states that insurance companies should be inspected by a supervisory authority in order to ensure appropriate business operation and to protect policy-holders. However, insurance premium rates are now liberalized in the sense that the obligation for the members of the rating organizations to use premium rates calculated by the rating organizations, is abolished. In July 2000, the Financial Services Agency (FSA) was established to take over the inspection and supervision of insurers which was on the change of the Financial Supervisory Agency since 1998. The FSA is placed under the Prime Minister's Office.

4. Conclusion

In this chapter, we first described how the automobile insurance market works in Quebec. This market is characterized by a dual organizational structure: a public monopoly offers compensation for bodily injuries in a pure no-fault system and the competitive private sector offers compensation for property damages under a liability system, but with a direct compensation agreement designed to reduce insurance costs. In other words, subrogation between insurers is not permitted.

The public monopoly, regulated by the government, reinvests a large fraction of its benefits in the market in order to reduce the cost of premiums. In fact, a good driver with no demerit points will pay for this insurance only $50 for two years of protection when renewing his driving license and about $117 a year for vehicle registration. Strong economies of scale are possible on administrative costs. Moreover, underwriting costs and marketing cost are very low by definition of this public monopoly scheme. And, this monopoly's large economies of scale seem to account for the very low-administrative costs documented.

The private sector is not regulated. Both ex-ante and ex-post pricing rules operate under free competition and the insurers' rate manuals must be publicly accessible. Since 1991, all accidents are reported to a central file which is available, as public information, to any insurer. Finally, the solvency of insurers is regulated by both levels of government according to where insurers are registered.

In that section, we also turned our attention to the use of traffic violations as an incentive for traffic safety. In Québec, since 1992, the SAAQ has been using demerit points accumulated over two years to set the public insurance rate for bodily injuries over the next two years. Those who commit various traffic violations accumulate demerit points and see their insurance premium rise. It has been judged preferable to base this bonus-malus system on demerit points rather than accidents: The public insurance plan is a no-fault regime, implying that the information about violations will more accurately measure deviant driving practice than that obtained about accidents.

The findings of the studies show that implementation of the new rate-setting scheme has reduced the number of accidents. Complementary studies are underway to isolate the interpretation of this finding. Are we really dealing with drivers' increased commitment to prevention or an elimination of bad risks? Recent findings seem to support the first interpretation and lead us to conclude that the new rate-setting scheme has encouraged drivers to be more prudent. Finally, we must emphasize that, by making the bonus-malus scheme part of a law which precludes the renegotiation of the initial contract in subsequent periods, the public insurer has implemented the efficiency of its scheme in terms of road safety in a world of full commitment.

In the second section, we have described the way of the automobile insurance market works in Europe and more particularly in France. As documented in Appendix A, the insurance business is now deregulated in many countries. In France, insurance is provided by the private sector. The market is not regulated for the basic pricing of insurance but a common bonus-malus scheme is administrated by the industry. Moreover, commitment by insurers is guaranteed by law and the bonus-malus score is transferable between insurers. The European Commission is discussing the possibility of recommending the abolition of the bonus-malus scheme because it may limit competition in the French automobile insurance market.

In that section, we argued that strong commitment is necessary to obtain efficiency with a bonus-malus scheme when driving activities are not controlled by insurers. Under competition, it is very difficult to implement such a commitment without using a law or regulation. Consequently, if the European Commission convinces the French Government to eliminate its current bonus-malus scheme, it would be necessary to find a substitute for the present mechanism in order to maintain the same incentives for road safety.

Moreover, as widely documented, it is not at all clear, that the actual bonus-malus scheme limits competition in the French automobile insurance market. In fact, it offers many advantages to consumers: a simple pricing scheme based on past experience; ease of movement between insurers and between cars, etc. Moreover, this form of regulation is transparent.

We have analyzed the pricing in this market by using a statistical sample of policy-holders. We have shown that the variables used by the industry screen very efficiently for the adverse selection problem: there is no residual adverse selection in the sample studied. Moreover we have shown that the bonus-malus variable is significant in explaining both the individual distribution of accidents and the individual choice of insurance coverage. So it represents a valuable source of information, that should create appropriate incentives in this market.

In the third section of the chapter, we have described the automobile insurance regime in Japan. This regime was strongly regulated until recently but there are discussions since 1998 about the possibility of deregulating the whole industry as well the Compulsory Automobile Liability Insurance (CALI).

In general, the environment of non-life insurance companies is rapidly changing as deregulation and liberalization of insurance develop steadily in Japan. However, three measures were

introduced in 2000 in order to protect policy holders' interest: 1) introduction of a solvency margin ratio; 2) introduction of an early warning measure band on the solvency margin ratio; and 3) establishment of the policy holders protection corporation to deal with the possible insolvency of insurers. It compensates 100% of the claims and return premiums for Compulsory Automobile Liability Insurance and 90% of the claims incurred from voluntary automobile insurance. Insurance rates are no more regulated: the obligation to use premium rates calculated by the rating organization was abolished.

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Appendix A
Insurance Regulation in Europe

Since July 1, 1994, a single insurance market is implemented in the European Community. It implies free movement of services and capital between member states. Particularly, it allows insurers to sell their products throughout the European Union without anti-competitive restrictions. Prior approval of contracts (products) premium rates were banned. Technical reserves are still regulated. Contract law remains country specific.

As indicated in the text, solvency regulation is at the European Union level. The following table presents an overbook of premium rates and bonus-malus scheme regulation and of guaranty funds situation for a sample of countries.

Table A-1 Sample of countries

Country	Premium rates (1997)	Guaranty Funds (1997)	Bonus-malus (1997)
Belgium	No regulation	Yes	No regulation
Finland	No regulation	Yes	Regulated
France	No regulation	Yes	Regulated
Germany	No regulation	Yes	No regulation
Italy	No regulation	Yes	No regulation
Spain	No regulation	No	No regulation
Sweden	No regulation	No	No regulation
United Kingdom	No regulation	Yes	No regulation

Appendix B

Table 2-4 Estimation of random-effects negative binomial model.
Dependent variable: total number of accidents*

	Coefficients	St.devi.	T-stat	P_value
Constant	1.1207	0.5426	2.0655	0.0389
Age and sex of driver				
Sexm	-0.1822	0.0540	-3.3724	0.0007
A1820	0.0076	0.2672	0.0285	0.9773
A2124	Omitted category			
A2534	-0.1101	0.1255	-0.8771	0.3805
A3544	-0.0992	0.1422	-0.6979	0.4853
A4554	-0.2394	0.1464	-1.6359	0.1019
A5564	-0.3246	0.1606	-2.0209	0.0433
A65plus	-0.2206	0.1780	-1.2395	0.2152
Experience				
Exp01	0.2704	0.2867	0.9429	0.3457
Exp23	Omitted category			
Exp410	-0.0979	0.2106	-0.4647	0.6421
Exp11plu	-0.2323	0.2190	-1.0607	0.2888
BONMALUS	**0.9174**	**0.1262**	**7.2679**	**0.0000**
Parameter a (Beta distribution)	40.6622	13.7181	2.9641	0.0030
Parameter b (Beta distribution)	1.3800	0.2143	6.4387	0.0000
Probability log	-7,895.85			
Number of observations	16,399			
Number of individuals	11,506			

* Age xy: age between x and y; Exp xy: experience between x and y years; BONMALUS: bonus-malus coefficient. Note that this regression was made with 60 additional control variables. Details are in Dahchour and Dionne (2000).

Appendix C
Description of the variables

Driving license variables

Sex of the license holder : dummy variable equal to 1 for a male.

Age at the beginning of each period : 7 classes of age ranging from 16 to 65 years old with the 17-to-19 class as the reference group.

Place of residence : 16 administrative regions in Quebec, with Montreal as the reference group.

Experience : Number of years since the first driving license, with class 3-to-5 years as the reference group.

Driving license class : Eleven driving classes. Driving classes define the type of vehicle the individual is allowed to drive.

Variables for regulatory changes and pricing

January 1990 : Dummy variable equal to 1 after the introduction of a new regulation for all drivers in Quebec : 15 points instead of 12 before a driving license suspension.

New drivers (1991) : Dummy variable equal to 1 after the introduction of a new regulation for new drivers in Quebec in November 14, 1991.

Law : Dummy variable equal to 1 for those who renew their driving license in periods after application of the new pricing scheme that uses memory. (After December 1, 1992).

Cyclical and risk-exposure variables

Number of days : Total number of days the driving license is valid during a year : this variable screens for two effects : individual risk exposure and aggregate characteristics of the year.

Unemployment rate in Quebec according to sex, age group, and periods : Less economic activity should generate fewer accidents and fewer demerit points (Statistics Canada SDDS 3701 STC [71-001]).

Aggregate gas sold in litres each year in Quebec according to periods : A positive sign is predicted in both regressions. (Statistics Canada SDDS 2150 STC [45-004]).

Time trend : Trend variable that takes into account possible reductions in the distributions of both accidents and demerit points for reasons that are not controlled by the variables in the model.

Law trend : An interaction variable to isolate the effect of the change in law from the time trend. If the trend variable is significant in the regression, this law trend variable will indicate how the new pricing scheme, with its use of memory, affects the time trend variable.

Past experience variables

Demerit points accumulated: This variable is to test the predictive power of the demerit points accumulated in period *(t-1)* on the distribution of accidents in period *t*.

Driving license suspensions : The number of driving license suspensions accumulated due to a driver's criminal offenses during period *(t-1)* is used as an explanatory variable for accidents in period *t*. Most of the suspensions are alcohol related.